

## SEQUENCE LISTING

<110> The Trustees of the University of Pennsylvania  
 Stedman, Hansell  
 Su, Leonard  
 Mitchell, Marilyn

<120> Microutrophin and Uses Thereof

<130> UPN-Q3355PCT

<150> US 60/538,877

<151> 2004-01-23

<160> 12

<170> PatentIn version 3.3

<210> 1

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<212> DNA

<213> Artificial

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 <213> Artificial

<220>  
 <223> Canine Microutrophin

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Gly Lys Pro Pro Ile Asn Asp Met Phe Thr Asp Leu Lys Asp Gly Arg  
50 55 60

Lys Leu Leu Asp Leu Leu Glu Gly Leu Thr Gly Thr Ser Leu Pro Lys  
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Glu Arg Gly Ser Thr Arg Val His Ala Leu Asn Asn Val Asn Arg Val  
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Leu Gln Val Leu His Gln Asn Asn Val Asp Leu Val Asn Ile Gly Gly  
100 105 110

Thr Asp Ile Val Asp Gly Asn His Lys Leu Thr Leu Gly Leu Leu Trp  
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Ser Ile Ile Leu His Trp Gln Val Lys Asp Val Met Lys Asp Val Met  
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Ser Asp Leu Gln Gln Thr Asn Ser Glu Lys Ile Leu Leu Ser Trp Val  
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Arg Gln Ser Thr Arg Pro Tyr Ser Gln Val Asn Val Leu Asn Phe Thr  
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 Thr Ser Trp Thr Asp Gly Leu Ala Phe Asn Ala Val Leu His Arg His  
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 Lys Pro Asp Leu Phe Ser Trp Asp Arg Val Val Lys Met Ser Pro Ile  
 195 200 205  
 Glu Arg Leu Glu His Ala Phe Ser Lys Ala Gln Thr Tyr Leu Gly Ile  
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 Glu Lys Leu Leu Asp Pro Glu Asp Val Ala Val Gln Leu Pro Asp Lys  
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 Lys Ser Ile Ile Met Tyr Leu Thr Ser Leu Phe Glu Val Leu Pro Gln  
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 Gln Val Thr Leu Asp Ala Ile Arg Glu Val Glu Thr Leu Pro Arg Lys  
 260 265 270  
 Tyr Lys Lys Glu Cys Glu Glu Gly Glu Ile Ser Ile Gln Ser Ser Ala  
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 Pro Glu Glu Glu His Glu Cys Pro Gly Ala Glu Thr Pro Ser Thr Val  
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 Glu Glu Glu Phe Glu Ile Gln Glu Gln Met Thr Leu Leu Asn Ala Arg  
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 Trp Glu Ala Leu Arg Val Asp Ser Met Asn Arg Gln Ser Arg Leu His  
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Asp Val Leu Met Glu Leu Gln Lys Lys Gln Leu Gln Gln Leu Ser Ala  
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 Arg Leu Gln Asn Asp Leu Glu Ala Glu Gln Val Lys Val Asn Ser Leu  
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 Thr His Met Val Val Ile Val Asp Glu Asn Ser Gly Glu Ser Ala Thr  
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 Val Cys Arg Trp Thr Glu Glu Arg Trp Ser Arg Leu Gln Glu Ile Asn  
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 Ile Leu Trp Gln Glu Leu Leu Glu Glu Gln Cys Leu Leu Lys Ala Trp  
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 Lys Glu Asp Met Glu Met Lys Arg Gln Ala Leu Asp Gln Leu Ser Glu  
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 595 600 605  
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 Val Gln Arg Leu Glu Asp Ser Ser Asn Gln Val Thr Gln Ala Val Ala  
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 Lys Leu Gly Met Ser Gln Ile Pro Gln Lys Asp Leu Leu Glu Thr Val  
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 Arg Ile Arg Glu Gln Val Thr Thr Lys Arg Ser Lys Gln Glu Leu Pro  
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 Pro Pro Pro Pro Pro Lys Lys Arg Gln Ile Pro Val Asp Leu Glu Lys

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 Glu Ile Ala Pro Ile Asn Leu Lys Val Lys Thr Val Asn Asp Leu Ser  
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 Ser Gln Leu Ser Pro Leu Asp Leu His Pro Ser Leu Lys Met Ser Arg  
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 Thr Thr Asn Glu Val Phe Lys Gln His Lys Leu Asn Gln Asn Asp Gln  
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 Gly Pro Thr Glu Met Cys Asp Gln Arg Gln Leu Gly Leu Leu Leu His  
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 Asn Asn Lys Pro Glu Ile Ser Val Lys Asp Phe Ile Asp Trp Met  
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 Arg Leu Glu Pro Gln Ser Met Val Trp Leu Pro Val Leu His Arg  
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 Val Ala Ala Ala Glu Thr Ala Lys His Gln Ala Lys Cys Asn Ile  
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 Cys Lys Glu Cys Pro Ile Val Gly Phe Arg Tyr Arg Ser Leu Lys  
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 His Phe Asn Tyr Asp Val Cys Gln Ser Cys Phe Phe Ser Gly Arg  
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 Thr Ala Lys Gly His Lys Leu His Tyr Pro Met Val Glu Tyr Cys  
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 Ile Pro Thr Thr Ser Gly Glu Asp Val Arg Asp Phe Thr Lys Val  
 1115 1120 1125  
 Leu Lys Asn Lys Phe Arg Ser Lys Lys Tyr Phe Ala Lys His Pro  
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&lt;400&gt; 3

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Leu Gln Arg Met Ala Val Ser Ser Pro Arg Tyr Gln Lys Leu Cys Lys  
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Asp Ile Gln Ala Glu Ile Asp Ala His Asn Asp Ile Phe Lys Ser Ile  
 50 55 60

Asp Gly Asn Arg Gln Lys Met Val Lys Ala Leu Gly Asn Ser Glu Glu  
 65 70 75 80

Ala Thr Met Leu Gln His Arg Leu Asp Asp Met Asn Gln Arg Trp Asn  
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Asp Leu Lys Ala Lys Ser Ala Ser Ile Arg Ala His Leu Glu Ala Ser  
 100 105 110

Ala Glu Lys Trp Asn Arg Leu Leu Met Ser Leu Glu Glu Leu Ile Lys  
 115 120 125

Trp Leu Asn Met Lys Asp Glu Glu Leu Lys Lys Gln Met Pro Ile Gly  
 130 135 140

Gly Asp Val Pro Ala Leu Gln Leu Gln Tyr Asp His Cys Lys Ala Leu  
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Arg Arg Glu Leu Lys Glu Lys Glu Tyr Ser Val Leu Asn Ala Val Asp  
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Gln Ala Arg Val Phe Leu Ala Asp Gln Pro Ile Glu Ala Pro Glu Glu  
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Pro Arg Arg Asn Leu Gln Ser Lys Thr Glu Leu Thr Pro Glu Glu Arg  
 195 200 205

Ala Gln Lys Ile Ala Lys Ala Met Arg Lys Gln Ser Ser Glu Val Lys  
 210 215 220

Glu Lys Trp Glu Ser Leu Asn Ala Val Thr Ser Asn Trp Gln Lys Gln  
 225 230 235 240

Val Asp Lys Ala Leu Glu Lys Leu Arg Asp Leu Gln Gly Ala Met Asp



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 Asp Leu Asp Ala Asp Met Lys Glu Ala Glu Ser Val Arg Asn Gly Trp  
 260 265 270  
 Lys Pro Val Gly Asp Leu Leu Ile Asp Ser Leu Gln Asp His Ile Glu  
 275 280 285  
 Lys Ile Met Ala Phe Arg Glu Glu Ile Ala Pro Ile Asn Phe Lys Val  
 290 295 300  
 Lys Thr Val Asn Asp Leu Ser Ser Gln Leu Ser Pro Leu Asp Leu His  
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 Pro Ser Leu Lys Met Ser Arg Gln Leu Asp Asp Leu Asn Met Arg Trp  
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 Lys Leu Leu Gln Val Ser Val Asp Asp Arg Leu Lys Gln Leu Gln Glu  
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 Ala His Arg Asp Phe Gly Pro Ser Ser Gln His Phe Leu Ser Thr Ser  
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 Ala Tyr Arg Thr Ala Ile Lys Ile Arg Arg Leu Gln Lys Ala Leu Cys  
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 Val Tyr Asp Thr Gly Arg Thr Gly Lys Ile Arg Val Gln Ser Leu Lys  
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 Ile Pro Thr Thr Ser Gly Glu Asp Val Arg Asp Phe Thr Lys Val Leu  
 675 680 685  
 Lys Asn Lys Phe Arg Ser Lys Lys Tyr Phe Ala Lys His Pro Arg Leu  
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 Ser Pro Gln Leu Phe His Asp Asp Thr His Ser Arg Ile Glu Gln Tyr  
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 Ala Thr Arg Leu Ala Gln Met Glu Arg Thr Asn Gly Ser Phe Leu Thr  
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 Gln Val Glu Tyr Glu Gln Leu Lys Asp Gln His Leu Arg Arg Gly Leu  
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 Pro Val Gly Ser Pro Pro Glu Ser Ile Ile Ser Pro His His Thr Ser  
 850 855 860  
 Glu Asp Ser Glu Leu Ile Ala Glu Ala Lys Leu Leu Arg Gln His Lys  
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 Gly Arg Leu Glu Ala Arg Met Gln Ile Leu Glu Asp His Asn Lys Gln  
 885 890 895  
 Leu Glu Ser Gln Leu His Arg Leu Arg Gln Leu Leu Glu Gln Pro Glu  
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 Ser Asp Ser Arg Ile Asn Gly Val Ser Pro Trp Ala Ser Pro Gln His  
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 Ser Ala Leu Ser Tyr Ser Leu Asp Pro Asp Ala Ser Gly Pro Gln Phe  
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 His Gln Ala Ala Gly Glu Asp Leu Leu Ala Pro Pro His Asp Thr Ser  
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35 40 45

Gly Lys Pro Pro Ile Asn Asp Met Phe Thr Asp Leu Lys Asp Gly Arg  
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Lys Leu Leu Asp Leu Leu Glu Gly Leu Thr Gly Thr Ser Leu Pro Lys  
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Glu Arg Gly Ser Thr Arg Val His Ala Leu Asn Asn Val Asn Arg Val  
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Leu Gln Val Leu His Gln Asn Asn Val Glu Leu Val Asn Ile Gly Gly  
100 105 110

Thr Asp Ile Val Asp Gly Asn His Lys Leu Thr Leu Gly Leu Leu Trp  
115 120 125

Ser Ile Ile Leu His Trp Gln Val Lys Asp Val Met Lys Asp Val Met  
130 135 140

Ser Asp Leu Gln Gln Thr Asn Ser Glu Lys Ile Leu Leu Ser Trp Val  
145 150 155 160

Arg Gln Thr Thr Arg Pro Tyr Ser Gln Val Asn Val Leu Asn Phe Thr  
165 170 175

Thr Ser Trp Thr Asp Gly Leu Ala Phe Asn Ala Val Leu His Arg His  
180 185 190

Lys Pro Asp Leu Phe Ser Trp Asp Lys Val Val Lys Met Ser Pro Ile  
195 200 205

Glu Arg Leu Glu His Ala Phe Ser Lys Ala Gln Thr Tyr Leu Gly Ile  
210 215 220

Glu Lys Leu Leu Asp Pro Glu Asp Val Ala Val Arg Leu Pro Asp Lys  
225 230 235 240

Lys Ser Ile Ile Met Tyr Leu Thr Ser Leu Phe Glu Val Leu Pro Gln  
245 250 255

Gln Val Thr Ile Asp Ala Ile Arg Glu Val Glu Thr Leu Pro Arg Lys  
 260 265 270  
 Tyr Lys Lys Glu Cys Glu Glu Glu Ala Ile Asn Ile Gln Ser Thr Ala  
 275 280 285  
 Pro Glu Glu Glu His Glu Ser Pro Arg Ala Glu Thr Pro Ser Thr Val  
 290 295 300  
 Thr Glu Val Asp Met Asp Leu Asp Ser Tyr Gln Ile Ala Leu Glu Glu  
 305 310 315 320  
 Val Leu Thr Trp Leu Leu Ser Ala Glu Asp Thr Phe Gln Glu Gln Asp  
 325 330 335  
 Asp Ile Ser Asp Asp Val Glu Glu Val Lys Asp Gln Phe Ala Thr His  
 340 345 350  
 Glu Ala Phe Met Met Glu Leu Thr Ala His Gln Ser Ser Val Gly Ser  
 355 360 365  
 Val Leu Gln Ala Gly Asn Gln Leu Ile Thr Gln Gly Thr Leu Ser Asp  
 370 375 380  
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 Trp Glu Ala Leu Arg Val Glu Ser Met Asp Arg Gln Ser Arg Leu His  
 405 410 415  
 Asp Val Leu Met Glu Leu Gln Lys Lys Gln Leu Gln Gln Leu Ser Ala  
 420 425 430  
 Trp Leu Thr Leu Thr Glu Glu Arg Ile Gln Lys Met Glu Thr Cys Pro  
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 465 470 475 480  
 Thr His Met Val Val Ile Val Asp Glu Asn Ser Gly Glu Ser Ala Thr  
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 530 535 540  
 Leu Thr Glu Lys Glu Glu Ala Leu Asn Lys Val Gln Thr Ser Asn Phe  
 545 550 555 560  
 Lys Asp Gln Lys Glu Leu Ser Val Ser Val Arg Arg Leu Ala Ile Leu  
 565 570 575  
 Lys Glu Asp Met Glu Met Lys Arg Gln Thr Leu Asp Gln Leu Ser Glu  
 580 585 590  
 Ile Gly Gln Asp Val Gly Gln Leu Leu Asp Asn Ser Lys Ala Ser Lys  
 595 600 605  
 Lys Ile Asn Ser Asp Ser Glu Glu Leu Thr Gln Arg Trp Asp Ser Leu  
 610 615 620  
 Val Gln Arg Leu Glu Asp Ser Ser Asn Gln Val Thr Gln Ala Val Ala  
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 675 680 685  
 Leu Arg Asp Leu Gln Gly Ala Met Asp Asp Leu Asp Ala Asp Met Lys  
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 Pro Ser Leu Thr Gln Thr Thr Val Met Glu Thr Val Thr Thr Val Thr  
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 Thr Arg Glu Gln Ile Leu Val Lys His Ala Gln Glu Glu Leu Pro Pro  
 Page 27

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Lys Val 1730	Asp Ser Thr Arg Asp 1735	Gln Ala Ala Asn Leu 1740
Arg Gly 1745	Asp His Cys Arg Lys 1750	Leu Val Glu Pro Gln 1755
Leu Asn 1760	His Arg Phe Ala Ala 1765	Ile Ser His Arg Ile 1770
Lys Ala 1775	Ser Ile Pro Leu Lys 1780	Glu Leu Glu Gln Phe 1785
Ile Gln 1790	Lys Leu Leu Glu Pro 1795	Leu Glu Ala Glu Ile 1800
Val Asn 1805	Leu Lys Glu Glu Asp 1810	Phe Asn Lys Asp Met 1815
Asn Glu 1820	Gly Thr Val Lys Glu 1825	Leu Leu Gln Arg Gly 1830
Gln Gln 1835	Arg Ile Thr Asp Glu 1840	Arg Lys Arg Glu Glu 1845
Lys Gln 1850	Gln Leu Leu Gln Thr 1855	Lys His Asn Ala Leu 1860
Arg Ser 1865	Gln Arg Arg Lys Lys 1870	Ala Leu Glu Ile Ser 1875
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Asp Ile 1895	Glu Lys Lys Leu Ala 1900	Ser Leu Pro Glu Pro 1905
Arg Lys 1910	Ile Lys Glu Ile Asp 1915	Arg Glu Leu Gln Lys 1920
Glu Leu 1925	Asn Ala Val Arg Arg 1930	Gln Ala Glu Gly Leu 1935



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 Page 35

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Arg Lys 2720	Glu Arg Leu Leu Glu 2725	Asp Ser Lys Gly Val 2730
Met Lys 2735	Gln Trp Gln Asp Leu 2740	Gln Gly Glu Ile Glu 2745
Asp Val 2750	Tyr His Asn Leu Asp 2755	Glu Asn Ser Gln Lys 2760
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